Royal College of Art
Postgraduate Art and Design

THE ROLES OF DESIGN AND CYBERNETICS FOR PLANETARY PROBE MISSIONS

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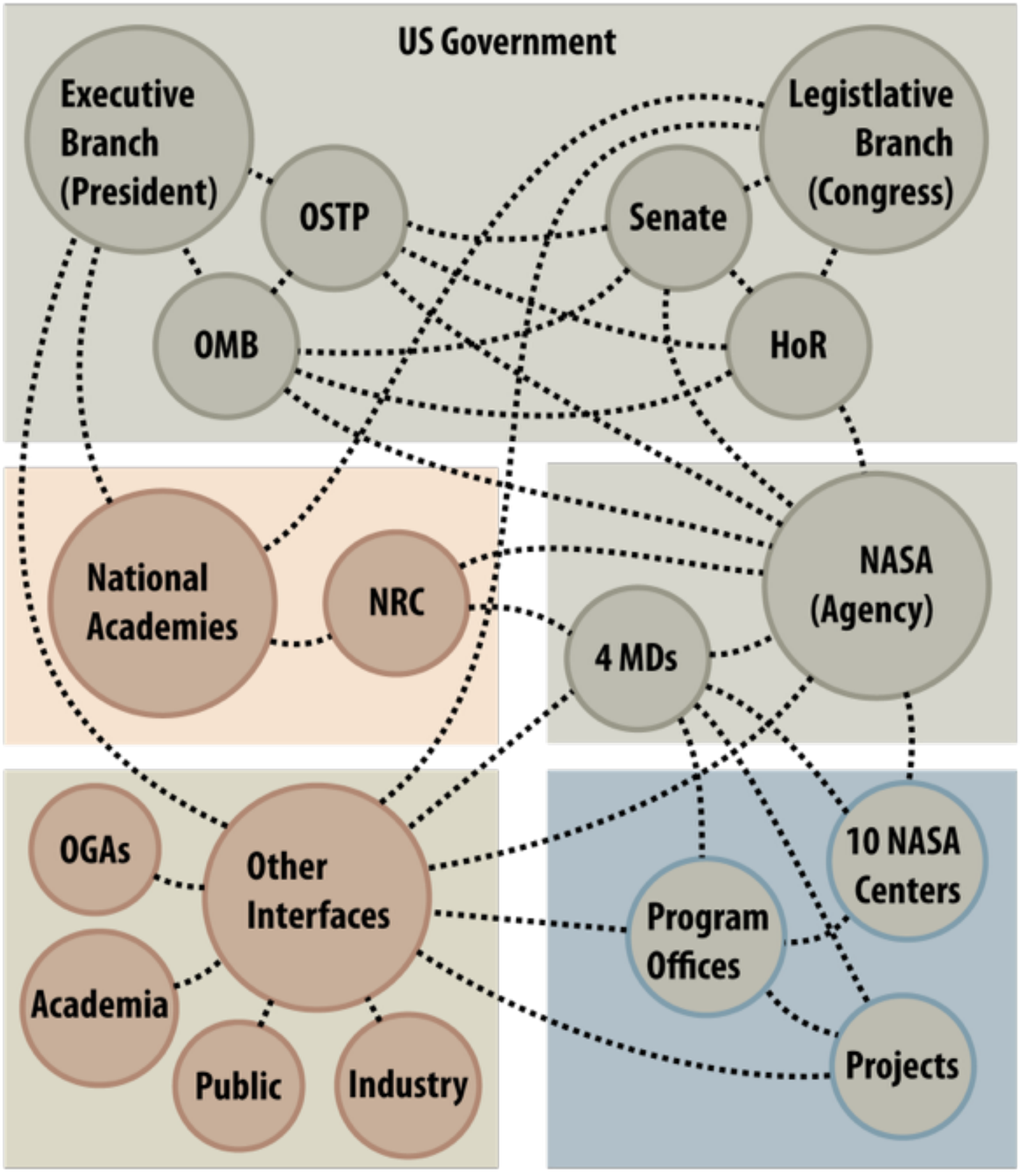
Innovation Barriers at NASA

- Risk-averse culture.
- Low priority on innovation combined with short term focus.
- Instability (e.g., funding uncertainties, project descopes and cancellations).
- Lack of opportunities.
- Process overload.
- Communication Challenges.
- Organizational inertia.

NASA's Wicked Problems



… not understood until after formulation of a solution.

… no stopping rules

… they have outcomes; not right or wrong.

… novel and unique.

…"one shot operation".

… no given alternatives.

OSTP.....Office of Science and Technology Policy
OMB.....Office of Management and Budget
HoR.....House of Representatives
OGAs.....Other Goverment Agencies

NRC.....National Research Council
MDs.....Mission Directorates at NASA
[L1]-[L3]...Organizational levels 1 to 3
SMEs.....Subjet Matter Experts

Note: Wicked Problems can't be solved, only altered or partially addressed

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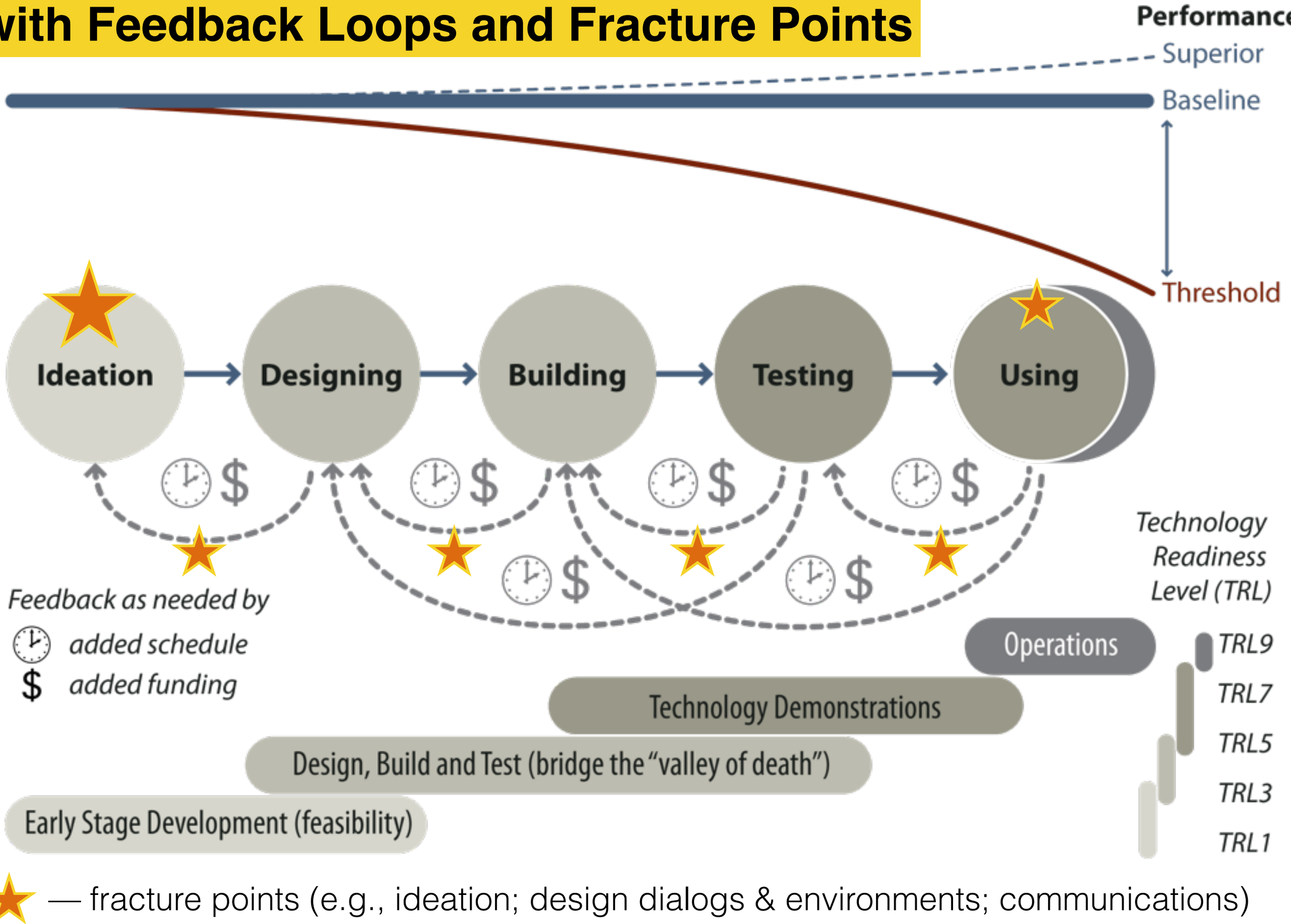
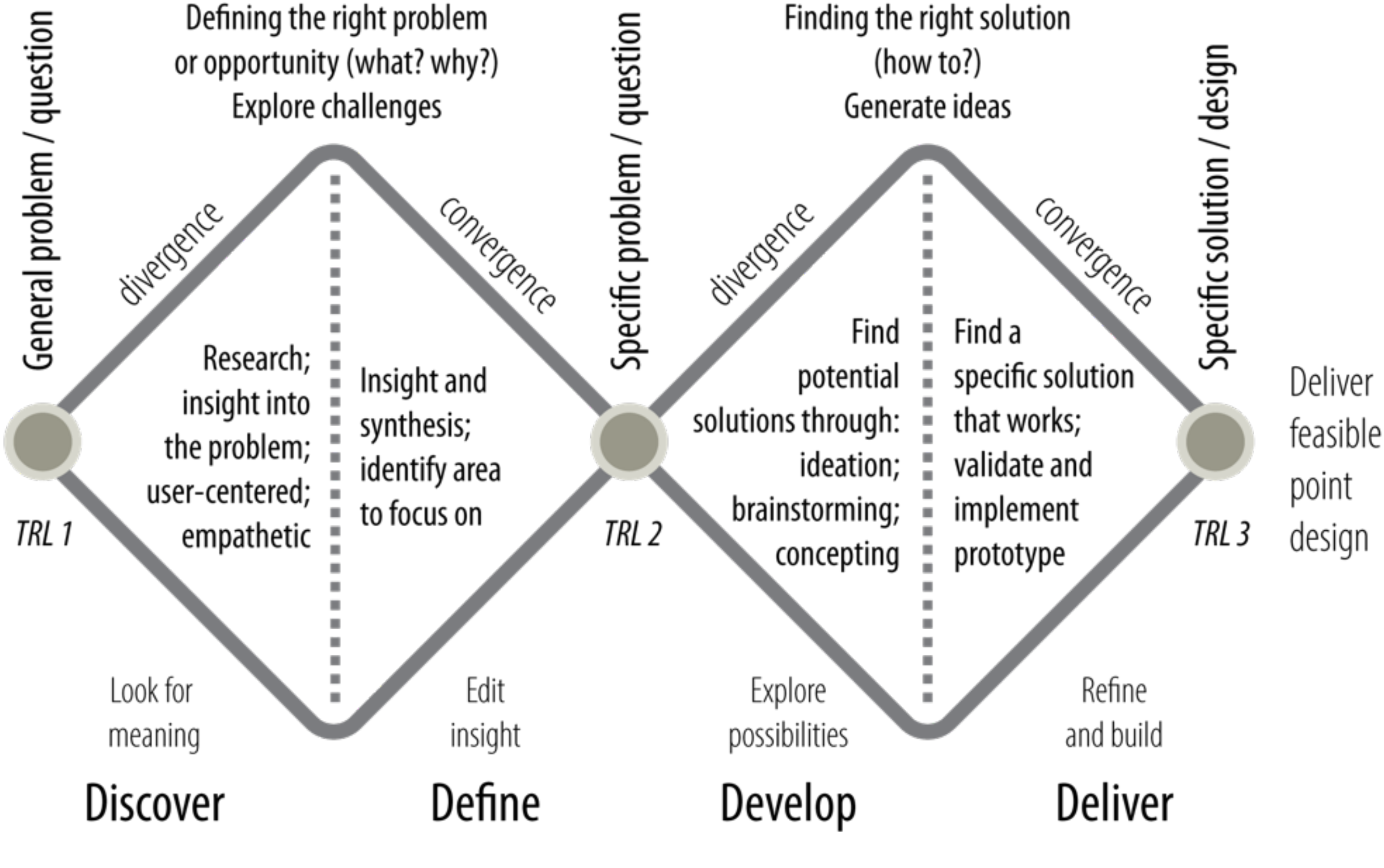
Innovation Cycle
with Feedback Loops and Fracture Points



— fracture points (e.g., ideation; design dialogs & environments; communications)

Double Diamond of Design
Leveraging Divergence/Convergence Cycles



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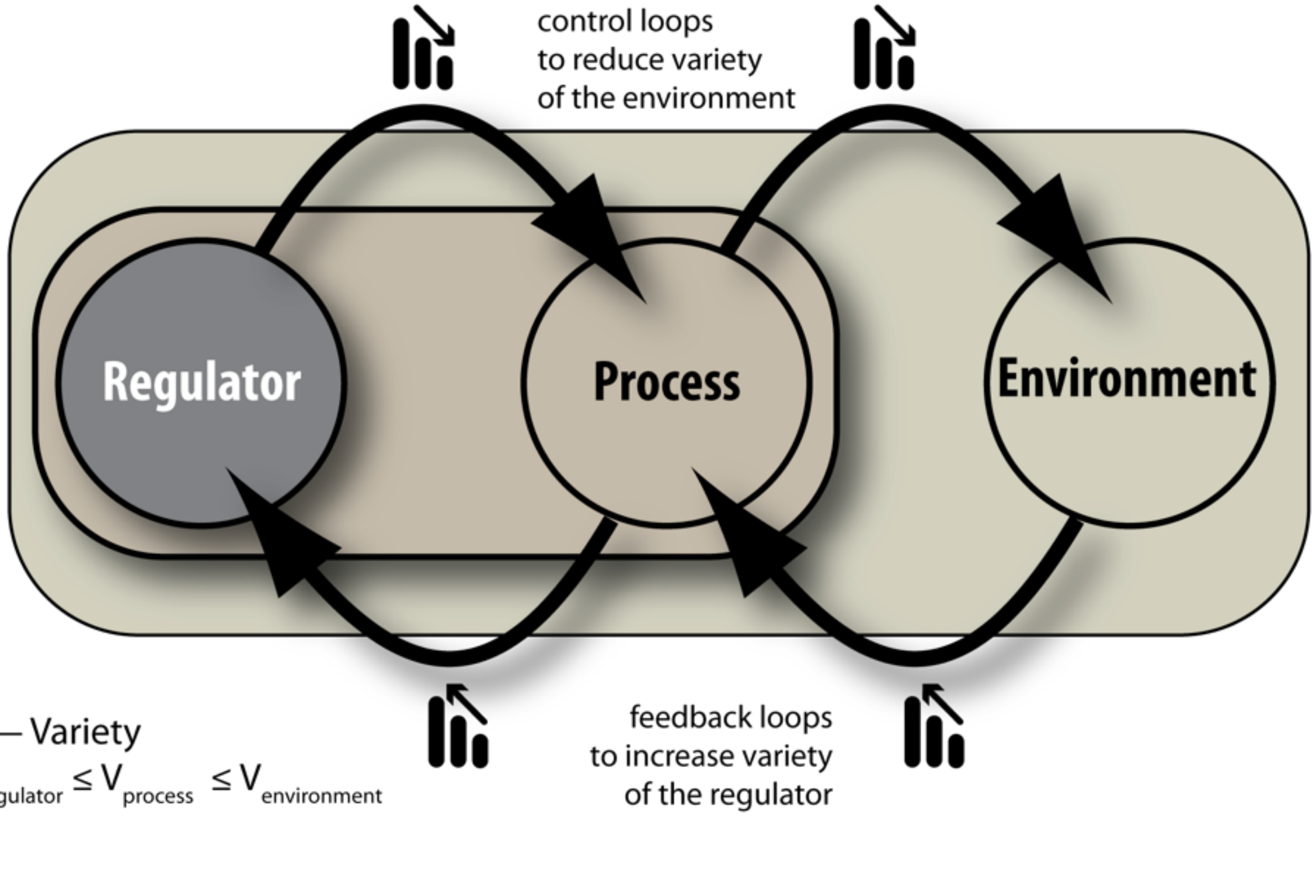
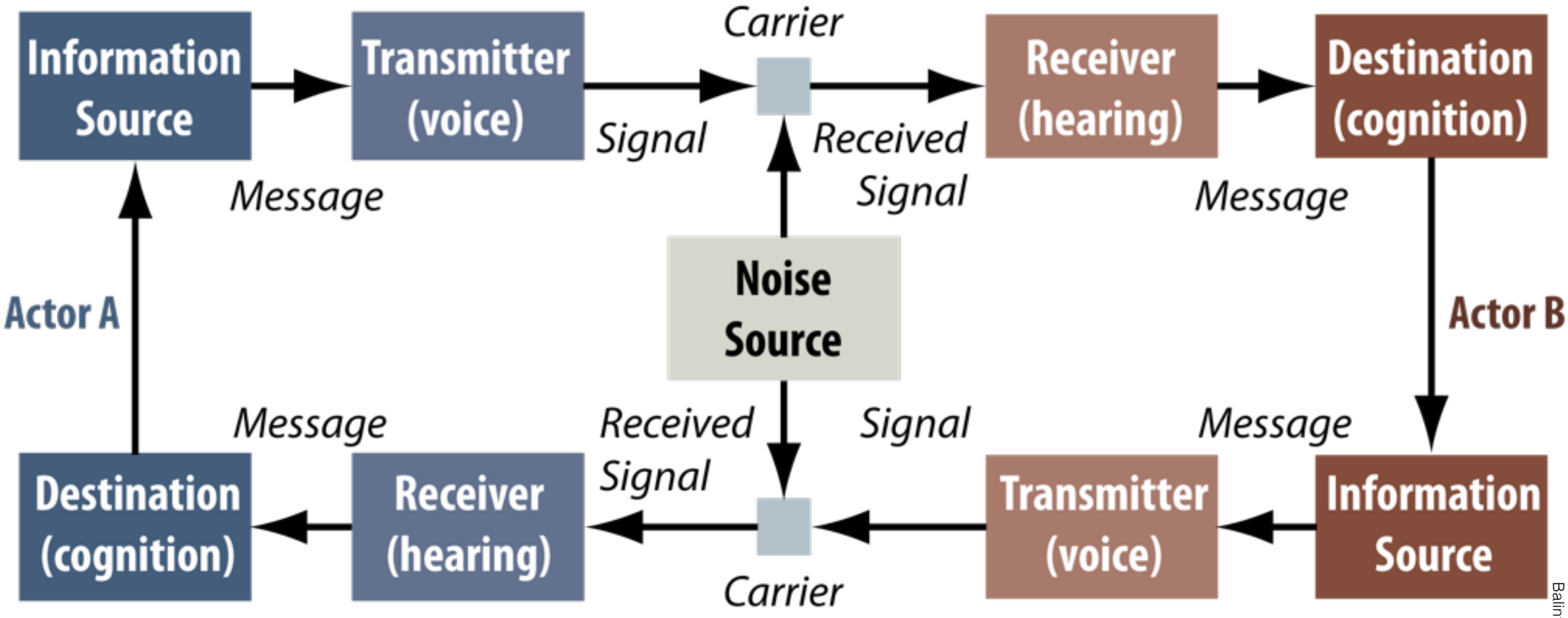
Simple Circular Cybernetic Loop
Improving Organizations with Focus on Connections



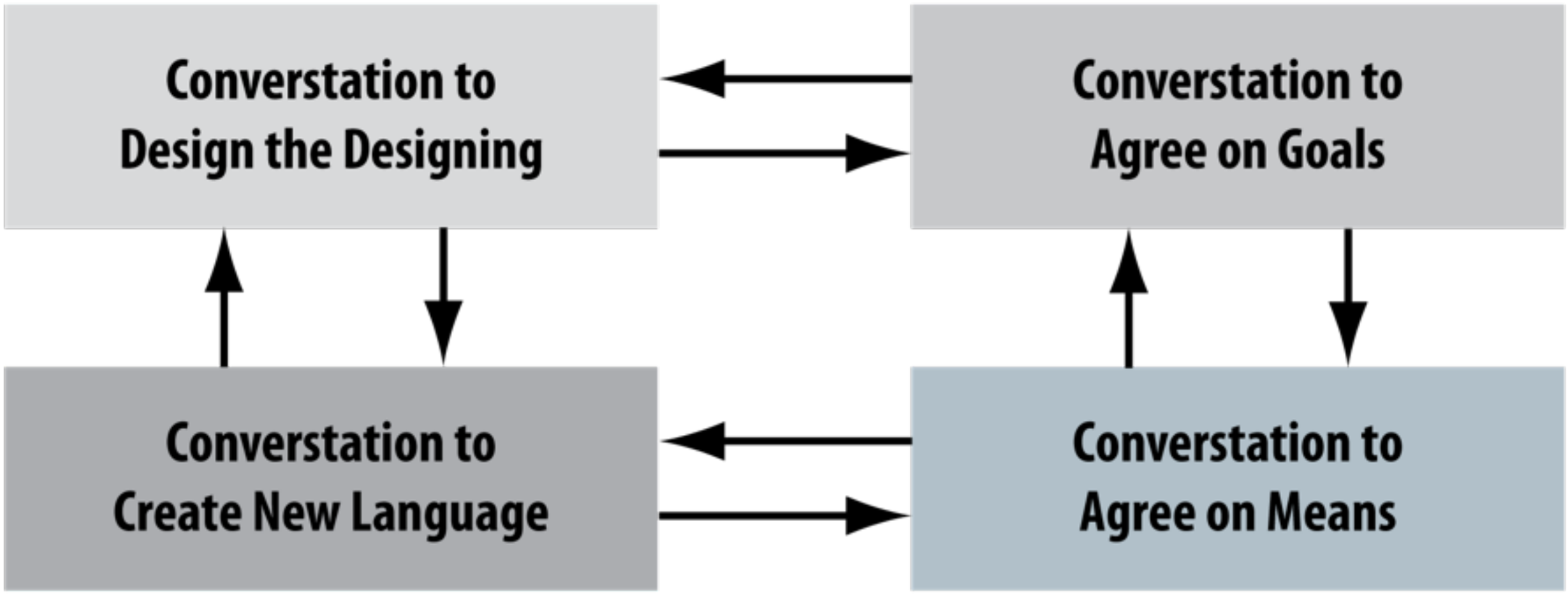
Circular Communication Loop Between Two Actors Exchanging Ideas through Circular Communications



Language Matters

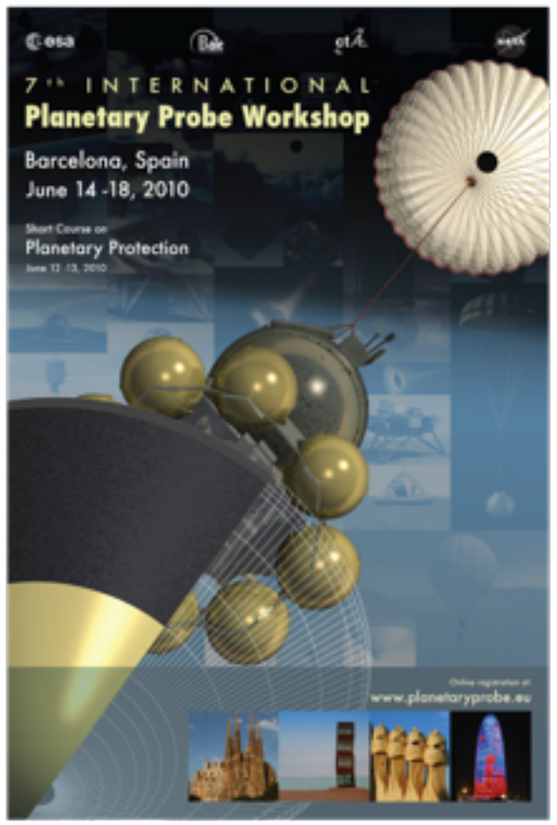
At IPPW we discuss EDL TPS options, including HIAD/IRVE; LDSD; W-TPS; and ADEPT.

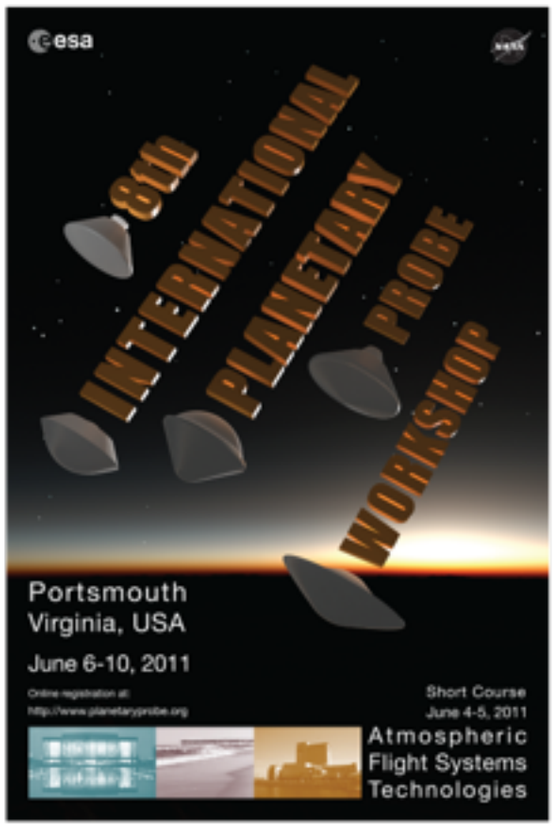
The Need for Designing the Design of Innovation Environments



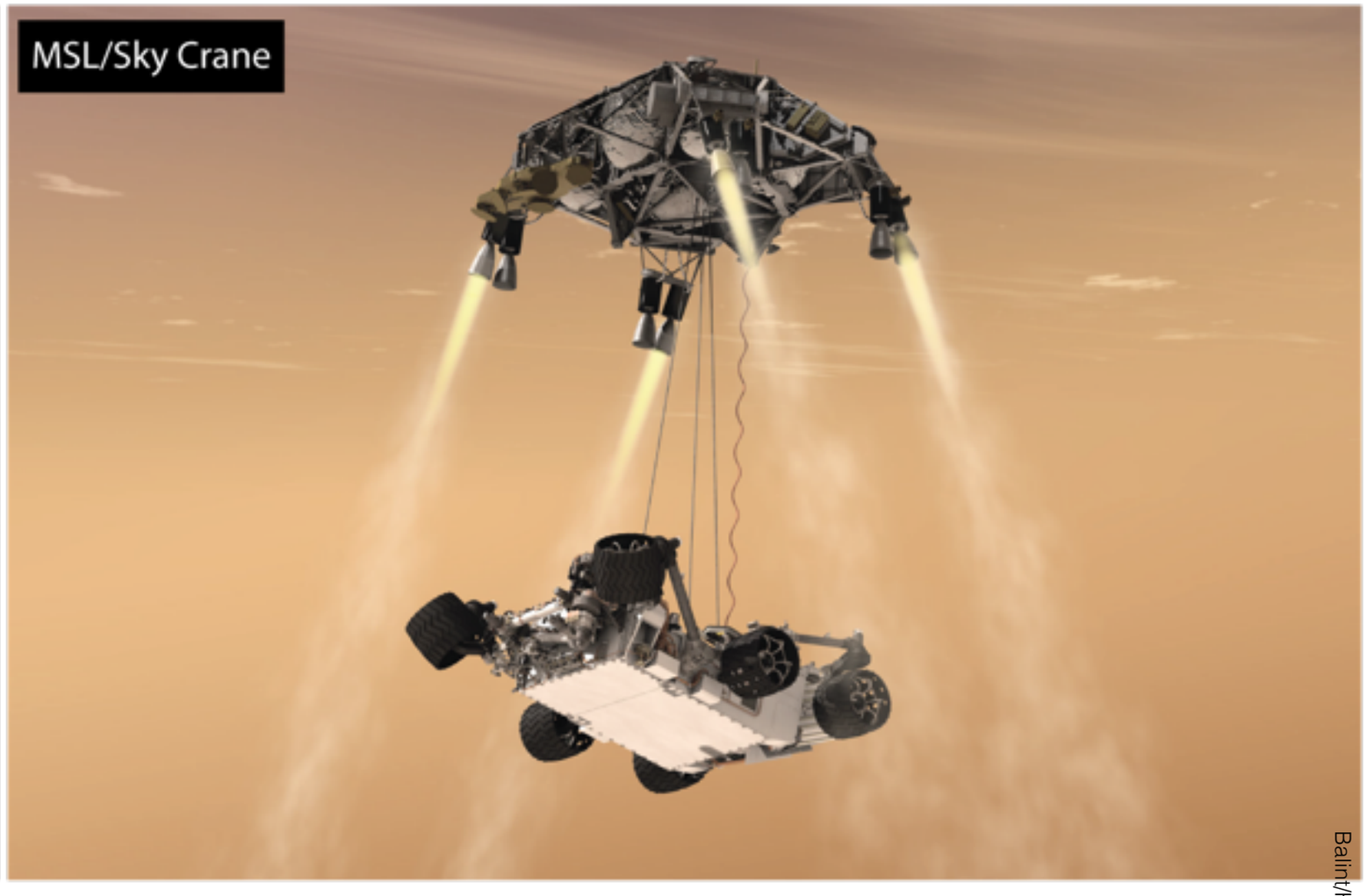
Ref: P Pangaro - Co-evolutionary design

Designing External Communications & Public Outreach

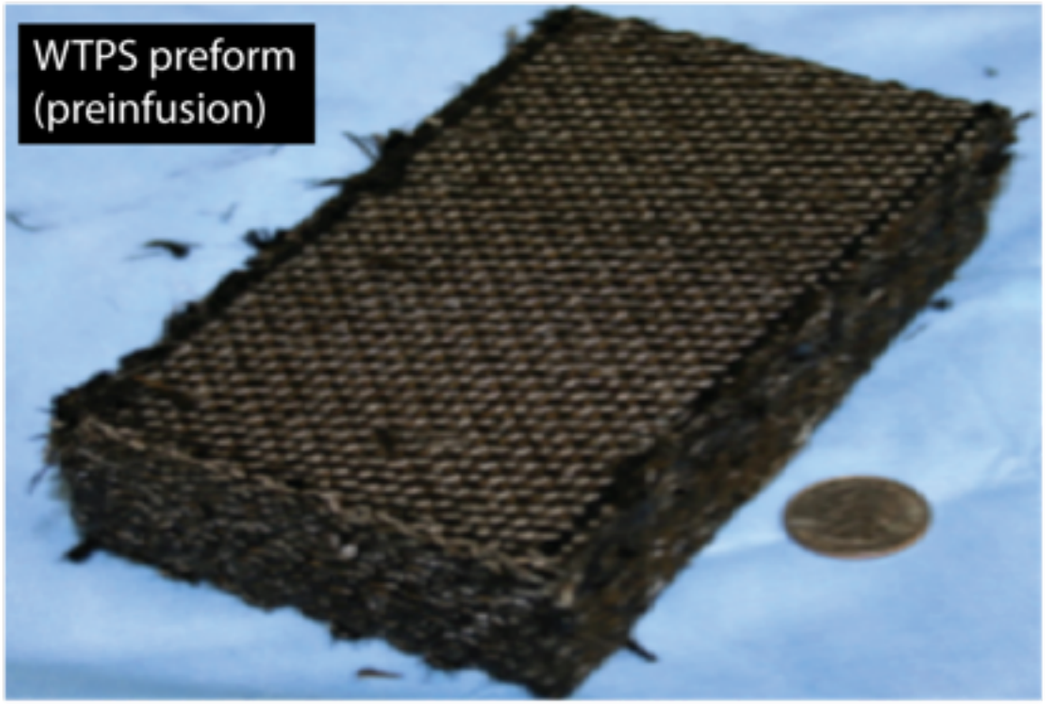


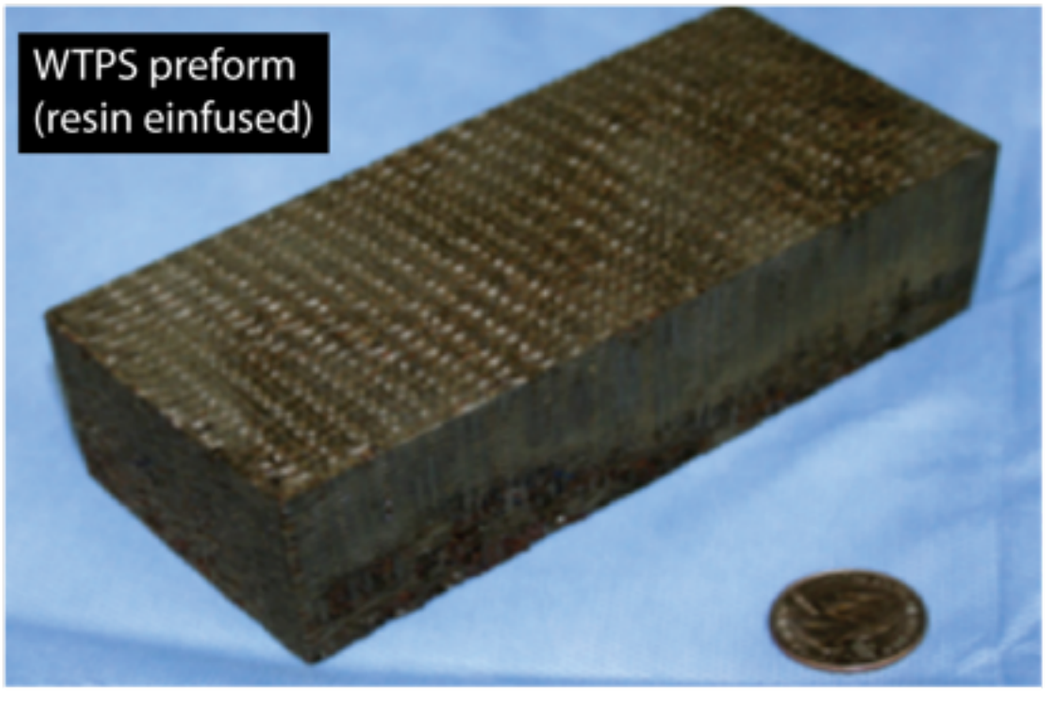


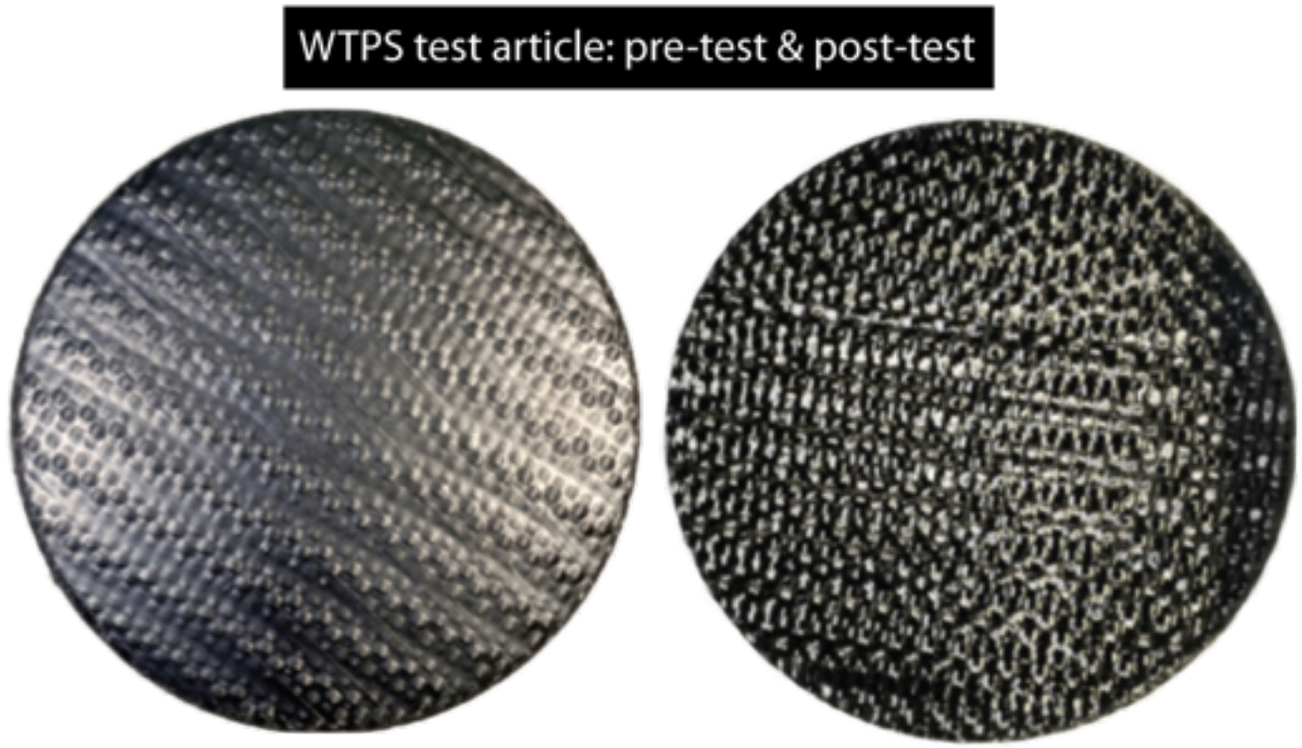
Design by Inverting the Meaning
“… the other way around…”

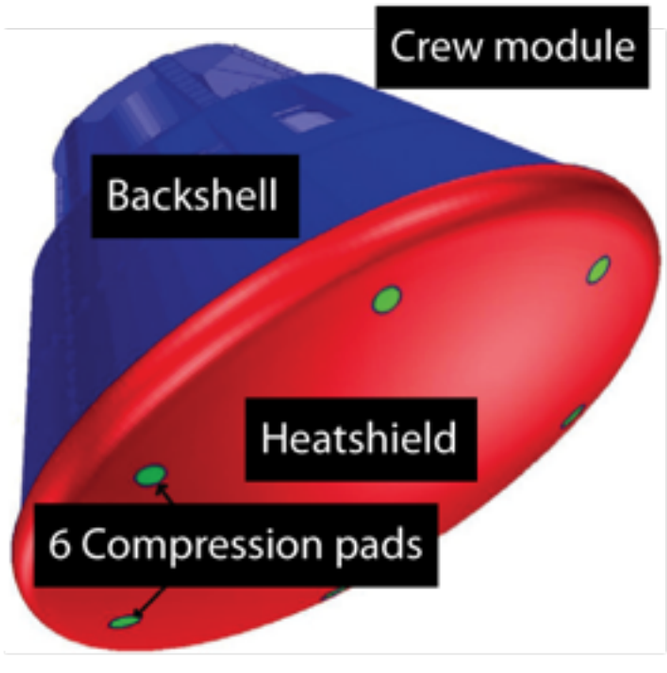


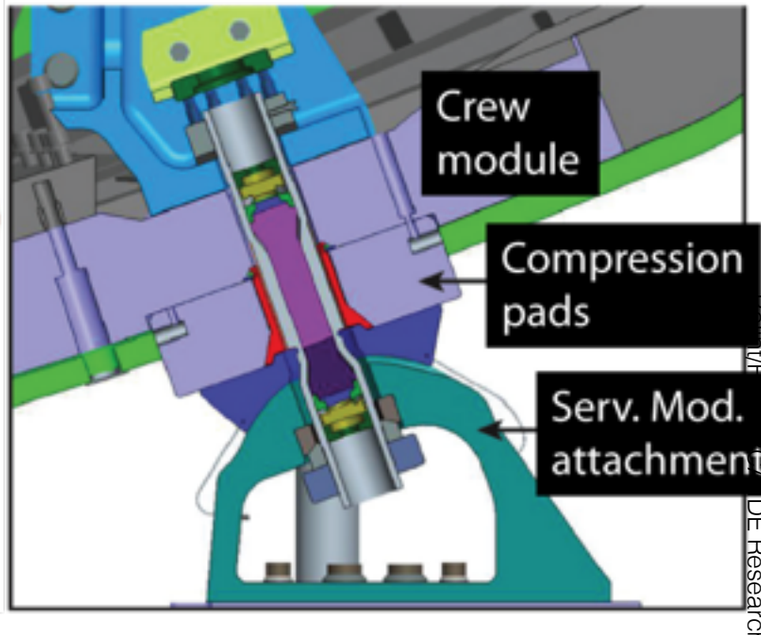
Design by Inverting the Meaning
"… from many to many… to … from one to many…"



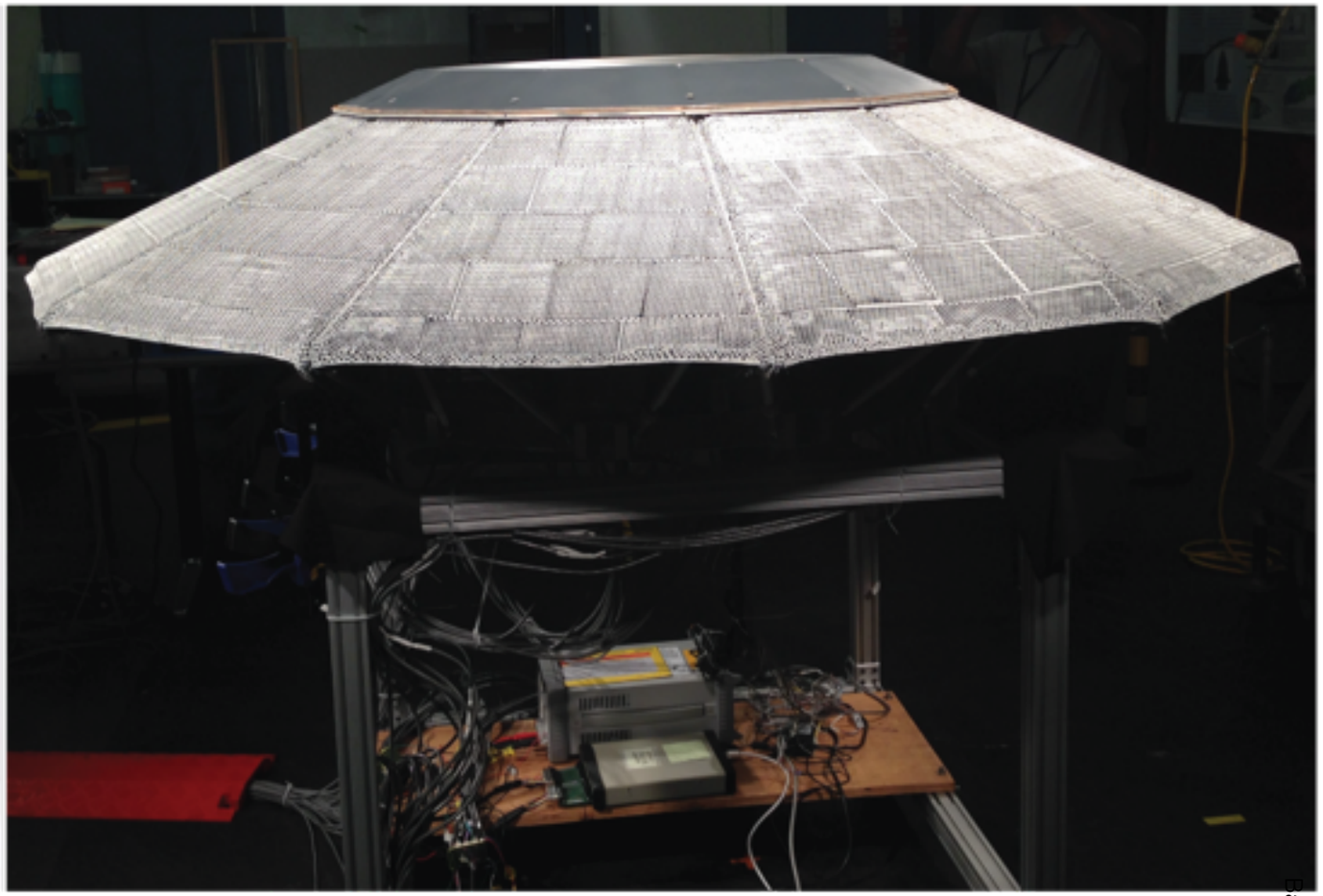






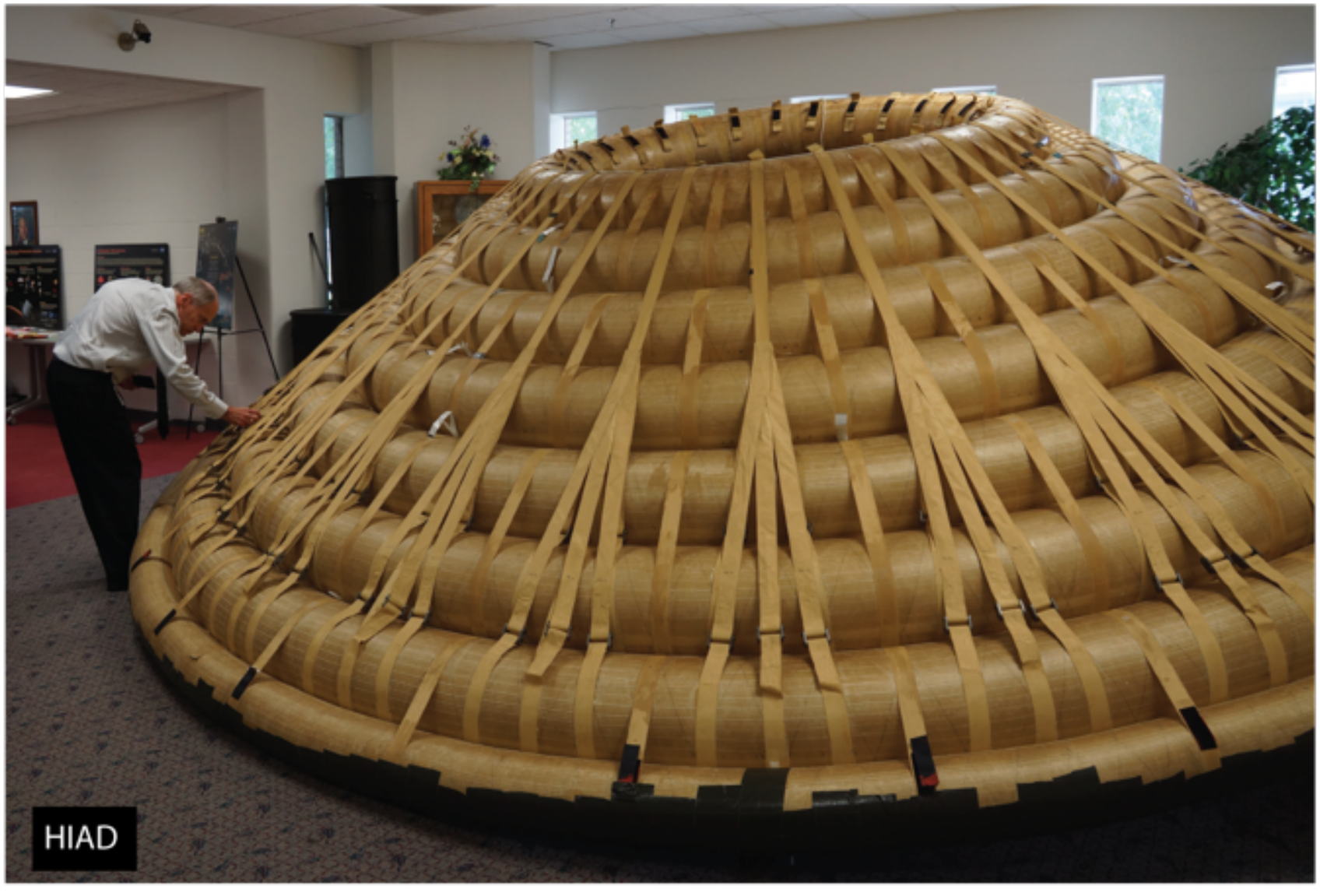


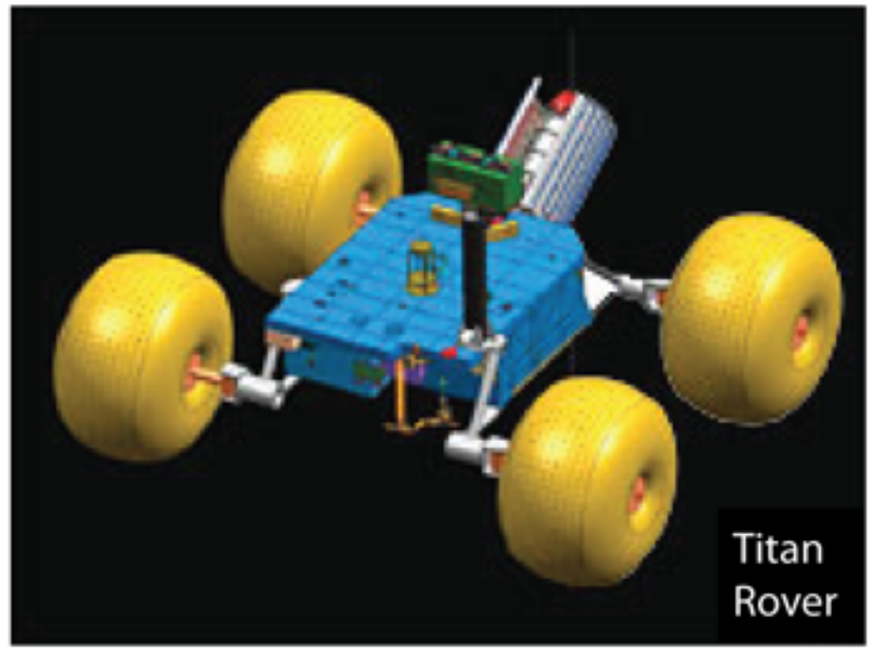
Design by Cross Pollinating Ideas “Umbrellas”



Design by Cross Pollinating Ideas Protecting “Payloads”

Design by Cross Pollinating Ideas
Inflatable Solutions





Design by Cross Pollinating Ideas
Rocket Assisted Landing Everywhere

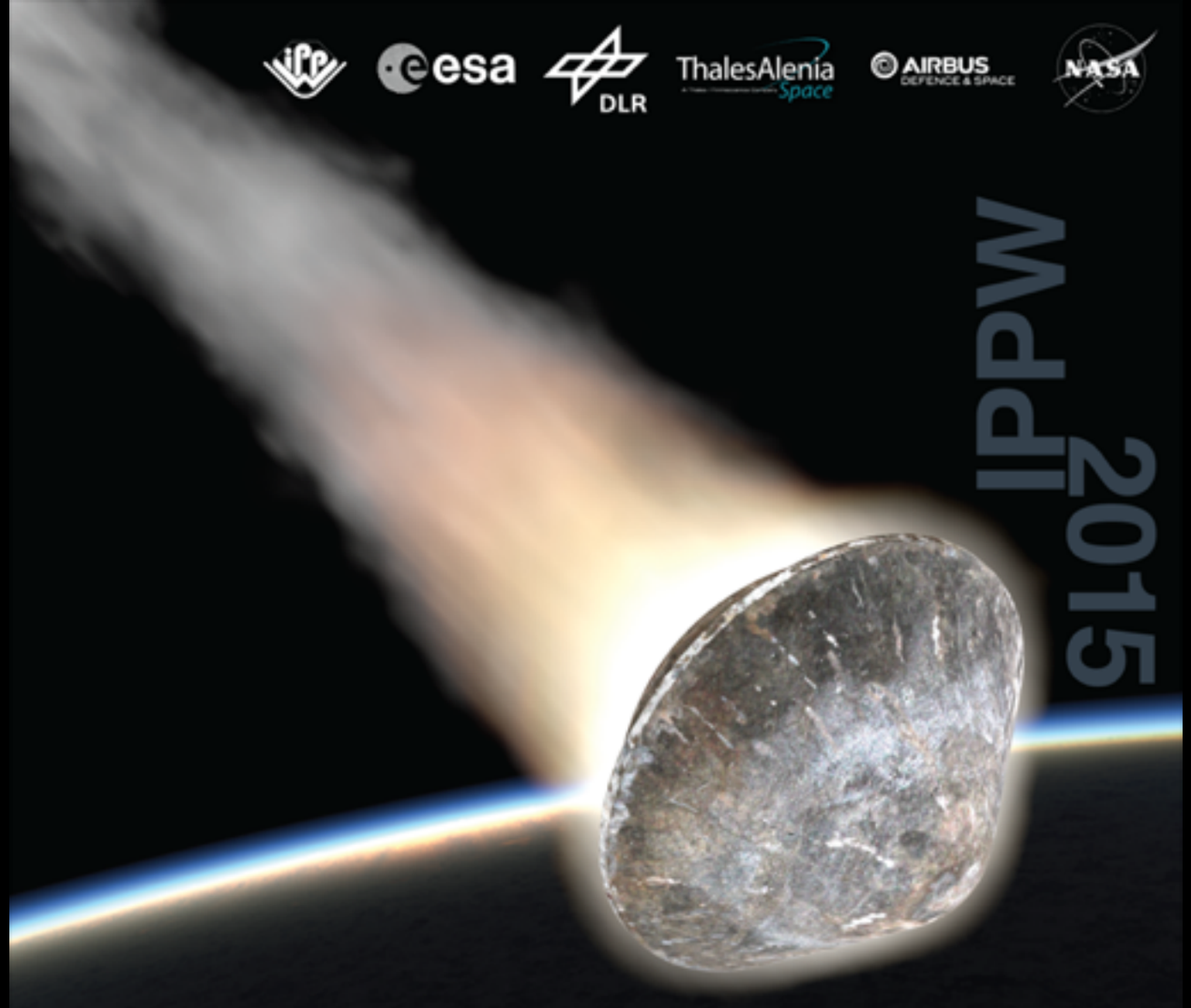
C130 Lockheed-Hercules Rocket Assisted Landing

Space X Mars landing concept

Summary

We need to

- use cybernetics to gain better perspectives
- introduce novel languages emerging from Design Dialogs, leading to new options and outcomes
- Design the Design of Innovation Environments
- change organizational culture through cybernetics (focus on connections not boxes in org charts)
- leverage multiple divergence/convergence cycles



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